

**Cellular and Molecular Biology, Block 1 Weekly Formative Questions
Week 1 (August 21-25, 2006)**

Dr. Chakraborty Cellular Structure & Function, Part 1

1. The process by which fluids can enter into a normal cell is called
 - A. pinocytosis.
 - B. phagocytosis.
 - C. receptor mediated endocytosis.
 - D. exocytosis.
 - E. vesicular transport.

2. Which of the following (s) you will NOT be able to see under a light microscope?
 - A. red blood cells.
 - B. Bacterium.
 - C. Nucleus.
 - D. Nucleolus.
 - E. ribosome.

Dr. Chakraborty Cellular Structure & Function, Part 2

3. You have used a fluorescent dye to locate cytoskeletal protein. You found high reactivity to desmin. Desmin is
 - A. found only in tumor cells.
 - B. a component of the nuclear envelope.
 - C. found in muscle cells.
 - D. a protein that causes Alzheimer's disease.
 - E. present in the nucleolus.

4. Microtubules are important for
 - A. protein synthesis.
 - B. regulation of transit across the nuclear envelope.
 - C. contraction of cells.
 - D. chromosomes movement during mitosis.
 - E. red blood cells contractile activity.

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Dr. Chakraborty Blood

5. The hemopoietic stem cells
- A. are pluripotential.
 - B. can not divide .
 - C. produce only one type of cells.
 - D. are completely differentiated cells.
6. Which one of the following class(es) of the major histocompatibility complex molecules (MHC) can present antigen to the helper T-cells?
- A. MHC I
 - B. MHC II
 - C. MHC III
 - D. Both MHC I and MHC II

Dr. Williams Introduction to Proteins: Part 1

7. Hydrogen bonds are usually _____ than covalent bonds (choose correct answer for blank)
- A. longer.
 - B. shorter.
 - C. equal in length.
 - D. stronger.
8. What charged group(s) is(are) present in glycine at a neutral pH?
- A. NH_3^+
 - B. COO^-
 - C. NH_2^+
 - D. A and B
 - E. A, B, and C

Dr. Williams Introduction to Proteins: Part 2

9. The configuration of most alpha-carbon atoms of amino acids linked in a peptide bond is
- A. cis.
 - B. circular.
 - C. parallel.
 - D. trans.
 - E. perpendicular.

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Dr. Williams Introduction to Proteins: Part 2 cont.

10. Secondary structure of polypeptide chains
- A. is the spatial arrangement of amino acid residues that are far apart in sequence.
 - B. cannot be predicted based upon amino acid sequence.
 - C. consist primarily of two regularly repeating (periodic) secondary structures.
 - D. is none of the above.

Dr. Williams Introduction to Proteins: Part 3

11. How do proteins find the correct conformation?
- A. Cooperative transition.
 - B. Cumulative selection by progressive stabilization of intermediates.
 - C. Random interactions.
 - D. A, B and C.
 - E. A and B.
12. When purifying enzymes, the assay for specific activity is often based on
- A. ultracentrifugation.
 - B. catalytic activity (measurement of end product).
 - C. pH.
 - D. temperature changes.
 - E. salt changes.

Dr. Smas Plasma Membrane 1

13. Which of the following interactions are not involved in assembly of the phospholipid bilayer?
- A. Van der Waals.
 - B. Covalent bonds between phosphate head groups.
 - C. Hydrophobic interactions.
 - D. Hydrogen bonds.
 - E. Electrostatic interactions.

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Dr. Smas Plasma Membrane 1 cont.

14. In the interactions of the red blood cell membrane with cytoskeleton, which glycoprotein is an integral membrane protein and the basis for the MN blood group?
- A. Spectrin.
 - B. Fibronectin.
 - C. Glycophorin.
 - D. Band 4.1.
 - E. Ankyrin.

Dr. Smas Plasma Membrane 2

15. During routine physical examination and laboratory testing on a 350 lb. 5'6" male you are concerned to find extremely elevated fasting glucose levels and elevated plasma insulin levels. These and other tests confirm a diagnosis of non-insulin dependent (Type II) diabetes and you decide to start him on a course of a TZD drug. The mode of function of the membrane transport protein that is important for insulin-stimulated glucose uptake in adipose tissue is
- A. secondary active transport.
 - B. primary active transport.
 - C. facilitated diffusion.
 - D. an ion pump.
 - E. a ligand-gated channel.
16. A 50 year old woman has been experiencing extreme fatigue for several months and has noticed intermittent swelling of her ankles and shortness of breath upon minor exertion. Blood tests indicate a lack of anemia. Additional echocardiogram testing indicated poor heart function with a markedly reduced ejection fraction of 20%. You are considering prescribing a cardiotonic steroid drug to increase heart function. Cardiotonic steroids directly exert its function by inhibiting which class of membrane protein?
- A. Ligand-gated ion channel.
 - B. ABC-Type transporter.
 - C. Facilitative transporter.
 - D. Voltage- gated ion channel.
 - E. A P-type ATPase ion pump.

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Dr. Crissman Epithelial Tissues

17. Select the **CORRECT** statement about epithelium.
- A. The composition of apical membrane in epithelia is exactly the same as the basolateral membrane.
 - B. Stereocilia are used to move spermatozoa through the male reproductive system.
 - C. The secretory units of a compound tubuloacinar gland has a basement membrane surrounding it.
 - D. All alveolar-shaped secretory units secrete by holocrine secretion mode.
 - E. Desmosomes use the transmembrane linker protein, integrin, to hold the adjacent cell membranes together.
18. Pemphigus vulgaris is an autoimmune disease that destroys
- A. zona occludens.
 - B. desmosomes.
 - C. connexons.
 - D. dynein in cilia.
 - E. none of the above.

(See next page for answers)

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Instructor	Question	Answer
Dr. Chakraborty	1	A
	2	E
	3	C
	4	D
	5	A
	6	B
Dr. Williams	7	A
	8	D
	9	D
	10	C
	11	E
	12	B
Dr. Smas	13	B
	14	C
	15	C
	16	E
Dr. Crissman	17	C
	18	B

Cellular and Molecular Biology, Block 1 Weekly Formative Questions
Week 2 (August 28-September 1, 2006)

Dr. Crissman Connective Tissue

1. Select the **CORRECT** statement about collagen formation.
 - A. Type I collagen is produced by fibrocytes and osteocytes.
 - B. The lack of hydroxylation of proline during collagen formation leads to the disease called rickets.
 - C. The aggregation of tropocollagen molecules occurs inside of the cell.
 - D. At one level, the collagen type I fiber is held together by the covalent bonding of hydroxyproline.
 - E. The alpha chains are formed from amino acids of which desmosine is the most common.

2. Select the **CORRECT** statement.
 - A. Interstitial fluid does not circulates through the extracellular space.
 - B. The amount of glycoproteins present in the extracellular space is key in the formation of interstitial fluid.
 - C. Blockage of the lymphatic vessels reduces edema.
 - D. Excess basement membrane in the extracellular space is a common cause of edema.
 - E. Edema is caused by excess water in the extracellular space.

3. The basement membrane
 - A. surrounds all "fixed" cells.
 - B. sequesters large amounts of histamine which is released during anaphyxis.
 - C. may act as a macromolecular sieve.
 - D. contains predominately type IX collagen in the lamina lucida.
 - E. contains large amounts of aggrecan in the lamina densa

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Dr. Crissman Cell Motility

4. Select the **CORRECT** statement.
- A. Leukocyte adhesion deficiency results in the inability of leukocytes to enter the extracellular space at infection sites.
 - B. Integrin is not involved in blood clotting.
 - C. The glycoprotein, aggrecan, promotes migration of mesenchymal cells during development.
 - D. Actin and myosin in motile cells is responsible for the swimming motion of the pseudopodia, which propels the cell through the ground substance of the extracellular matrix.
 - E. Integrin is the initial molecule that is responsible for directing a leukocyte where to leave the vessel during extravasation.

Dr. Manning TCA Cycle

5. The enzyme that catalyzes an anaplerotic reaction to regenerate a key intermediate in the citric acid cycle is
- A. succinate dehydrogenase.
 - B. aconitase.
 - C. citrate synthase.
 - D. pyruvate dehydrogenase (PDH).
 - E. pyruvate carboxylase
6. Which coenzyme is not required in the pyruvate dehydrogenase and α -ketoglutarate dehydrogenase reactions?
- A. Biotin
 - B. Lipoic acid
 - C. Thiamine pyrophosphate
 - D. FAD
 - E. NAD⁺
7. The substrates for the two enzymatic reactions in the citric acid cycle in which CO₂ is liberated are
- A. citrate and α -ketoglutarate.
 - B. isocitrate and α -ketoglutarate.
 - C. cis-aconitate and α -ketoglutarate.
 - D. citrate and isocitrate.
 - E. isocitrate and oxaloacetate.

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Dr. Manning Electron Transport & Oxidative Phosphorylation

8. The chemiosmotic coupling hypothesis of oxidative phosphorylation proposes that adenosine triphosphate is formed because
- A. of a change in the permeability of the inner mitochondrial membrane toward adenosine diphosphate (ADP).
 - B. of the formation of high-energy bonds in mitochondrial proteins.
 - C. ADP is pumped out of the matrix into the intermembrane space.
 - D. a proton gradient forms across the inner membrane.
 - E. protons are pumped into the mitochondrial matrix.
9. Which of the following statements is **CORRECT**?
- A. Cytochrome c can carry two electrons at a time during electron transport.
 - B. Dinitrophenol uncouples oxidative phosphorylation by dissipating the proton gradient across the inner mitochondrial membrane.
 - C. Cyanide reacts with cytochrome c.
 - D. Rotenone specifically inhibits cytochrome oxidase.
 - E. Heme A in cytochrome oxidase is identical with the heme group of hemoglobin.
10. Some of the free energy released in the mitochondrial electron transport chain can be harnessed to form adenosine triphosphate (ATP). How many moles of ATP can be formed per pair of electrons transferred from reduced nicotinamide-adenine dinucleotide (**NADH**) to oxygen?
- A. 0
 - B. 1.5
 - C. 2.5
 - D. 3.0
 - E. 4.0

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Dr. De La Serna Cell Cycle

11. Determine the stage of the cell cycle where each chromosome is composed of two chromatids in preparation for mitosis.
- A. G_1
 - B. S
 - C. M
 - D. G_2
 - E. G_0
12. The sputum (fluid coughed up from the lungs) of many smokers contain cells with mutations (errors) in the TRP53 gene. The smoking induced mutations appear to be an early signal showing that cancer of the lungs will follow. What is the likely relationship between early TRP53 mutations and the development of lung cancer?
- A. A TRP53 mutation directly stimulates the growth of cancer cells.
 - B. Mutations in TRP53 prevent abnormal cells from dying by apoptosis.
 - C. Mutant p53 triggers the M phase of the cell cycle leading to abnormal cell division.
 - D. A TRP53 mutation causes a cell to enter G_0 , blocking cell division.
 - E. A TRP53 mutation inactivates DNA repair mechanisms.

(See next page for answers)

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	2	E
	3	C
	4	A
Dr. Manning	5	E
	6	A
	7	B
	8	D
	9	B
	10	C
Dr. De La Serna	11	D
	12	B